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PRINCIPLE OF THE BOERNER AIRSHIP.

By A. Kapteyn.

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The Boerner airship is built on entirely different principles from ordinary airships, of which the Zeppelin is the best known type. Mr. Boerner has abandoned the rigid body of the Zeppelin and has adopted a body with a double keel forming a rigid platform for attaching the gas ballonets, which must support the whole in the air.

The body is provided with two rigid arched ends capable of withstanding the pressure of the wind (Figs. 3 and 4).

The gas bags are arranged above the metal platform (Fig. 1) in three rows of 17 each, as indicated in Fig. 4, by simple squares. There are therefore always three ballonets abreast, forming a section. Fig. 1 represents a transverse cut through such a section, which consists not of three simple ballonets but rather of compartments with flexible walls. The middle compartment A_1 contains hydrogen, but the side compartments are subdivided by double partitions, forming three compartments A_2, B_1 and C. The double partition B_1 is made very slack, so it can be inflated or deflated at will, like a balloon.

This whole series of compartments of a single series is inclosed in an envelope forming another shallow compartment B_2 surrounding all the others.

The compartments marked A_1 and A_2 contain hydrogen. The ones marked B_1 and B_2 contain nitrogen. Those marked C contain air. They are under a pressure of 10 mm of water above the normal. Thus

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all the hydrogen compartments are surrounded by a layer of nitrog in order to prevent the formation of an explosive mixture, so extremely dangerous in airships.

There are various valves and communicating tubes not shown in the diagrams. Compartments A_1 and A_2 communicate freely through a tube. Compartment C communicates with the outside air through a valve under a pressure of 10 mm of water. Compartments B_1 and B_2 communicate with each other. All the compartments are subjected to the same pressure of 10 mm of water above that of the surrounding air.

Functioning. - After being charged with gas at the proper pressure, the airship rises. The gas in the compartments A_1 and A_2 expands and exerts a pressure on the double partition B_1. The nitrogen contained in the latter transmits this pressure to the air in compartment C, some of which is discharged into the atmosphere through the safety valve already mentioned.

On starting, the air compartments C contain about 25% of the volume of the hydrogen carried, whence it follows that the airship can ascend 3000 meters before the expansion of the hydrogen drives all the air from the compartments C. The latter are provided with blowers, by means of which atmospheric air may be again forced in, in order to make the airship descend.

In this manner, the vertical movements of the airship are produced without the loss of hydrogen, nor a single kilogram of ballast, which constitutes one of the great advantages of the Boerner airship.

Engines.- On either side of the airship there is a series of engines, each engine driving a propeller whose axis of rotation can be placed at any angle of inclination desired, thereby rendering it possible to exercise with each engine individually a force on the airship tending to make it advance, back, ascend or descend at will (Figs. 1 and 2). This disposition is important in case the airship should suddenly enter a colder, and consequently denser, layer of air. The airship would then immediately climb in a pronounced manner, which movement, in the case of a Zeppelin, could only be arrested by releasing hydrogen, but which may be easily arrested, in the case of the Boerner, by placing the axes of some of the propellers in a vertical position (Fig. 2), so as to offset by dynamic force the climbing tendency produced by the difference of temperature of the surrounding air.

But this is not all. In the case of the Zeppelin, the temperature of the hydrogen in the ballonets falls to that of the surrounding air and consequently the airship grows heavier and begins to descend with a motion that can only be arrested by promptly releasing ballast. In the case of the Boerner, if there is a descending tendency which it is desired to stop, it is only necessary to exert, by means of propellers, a dynamic lifting force. In a word, the movements of the Boerner airship are under absolute control.

Carrying Capacity.- The Zeppelin or rigid type is greatly handicapped by its metal hull, which is so heavy that it is hardly possible to carry passengers or merchandise. It goes without saying that the Boerner airship, with its strong metal body, is both stronger to withstand all stresses which can be brought to bear upon it and leaves at the same time a much wider margin for carrying a large number of passengers and large quantities of freight.

Only the principle and the general lines of the Boerner airship have been given above. The completed project, which has been carefully worked out and computed, contains modifications of special parts, but the principle remains as here described.

Translated by the National Advisory Committee for Aeronautics.

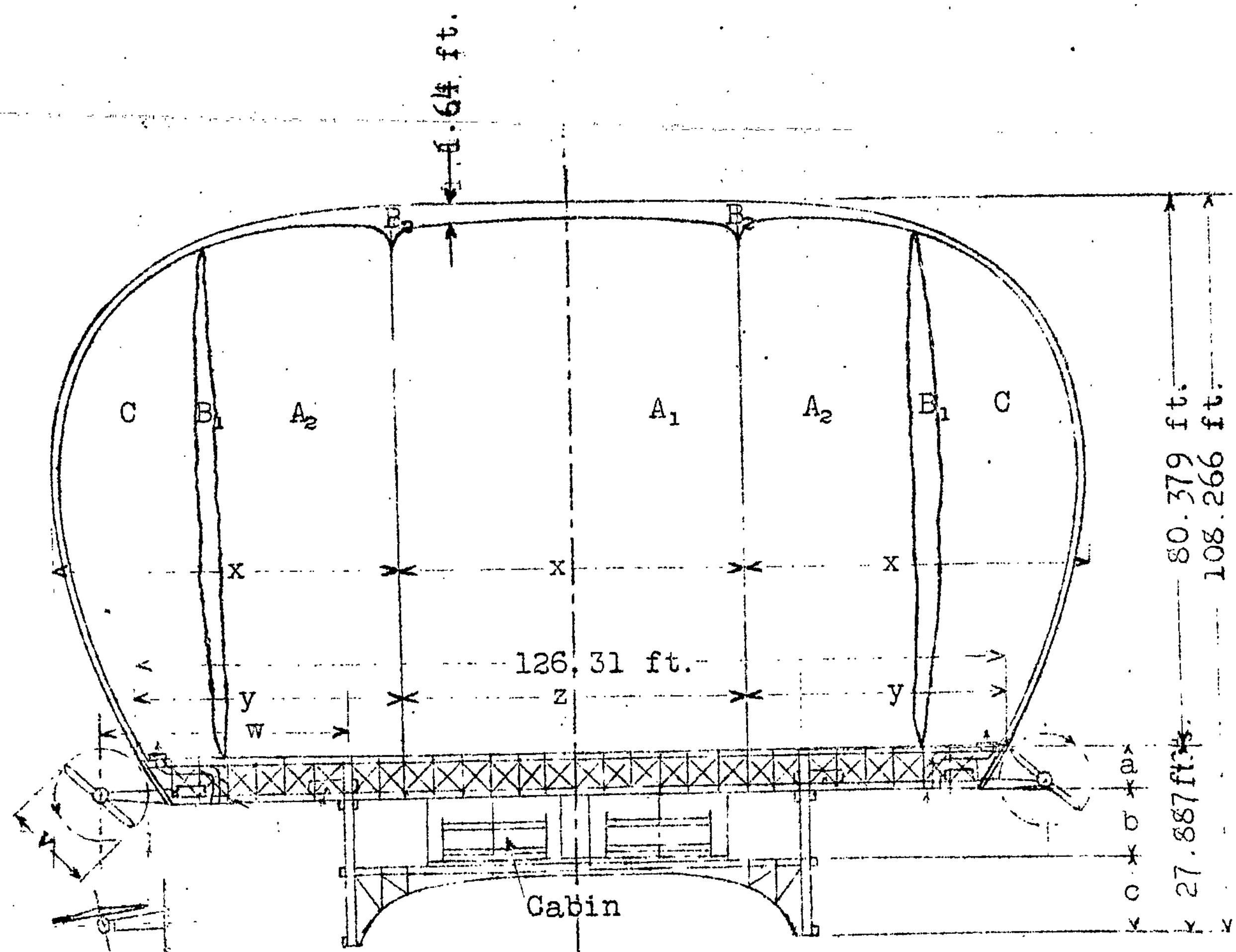
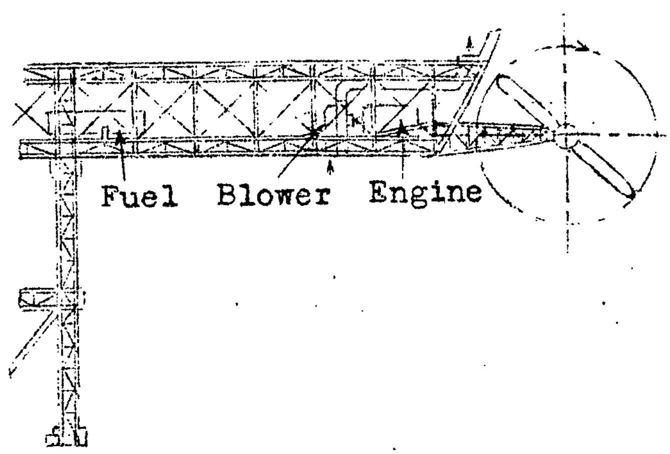


Fig. 2

Fig. 1.

a = 6.562 ft.
b = 9.842 ft.
c = 11.483 ft.
v = 13.123 ft.
w = 34.776 ft.
x = 49.213 ft.
y = 30.347 ft.
z = 65.616 ft.



Figs. 1 and 2. Transverse sectional elevation.

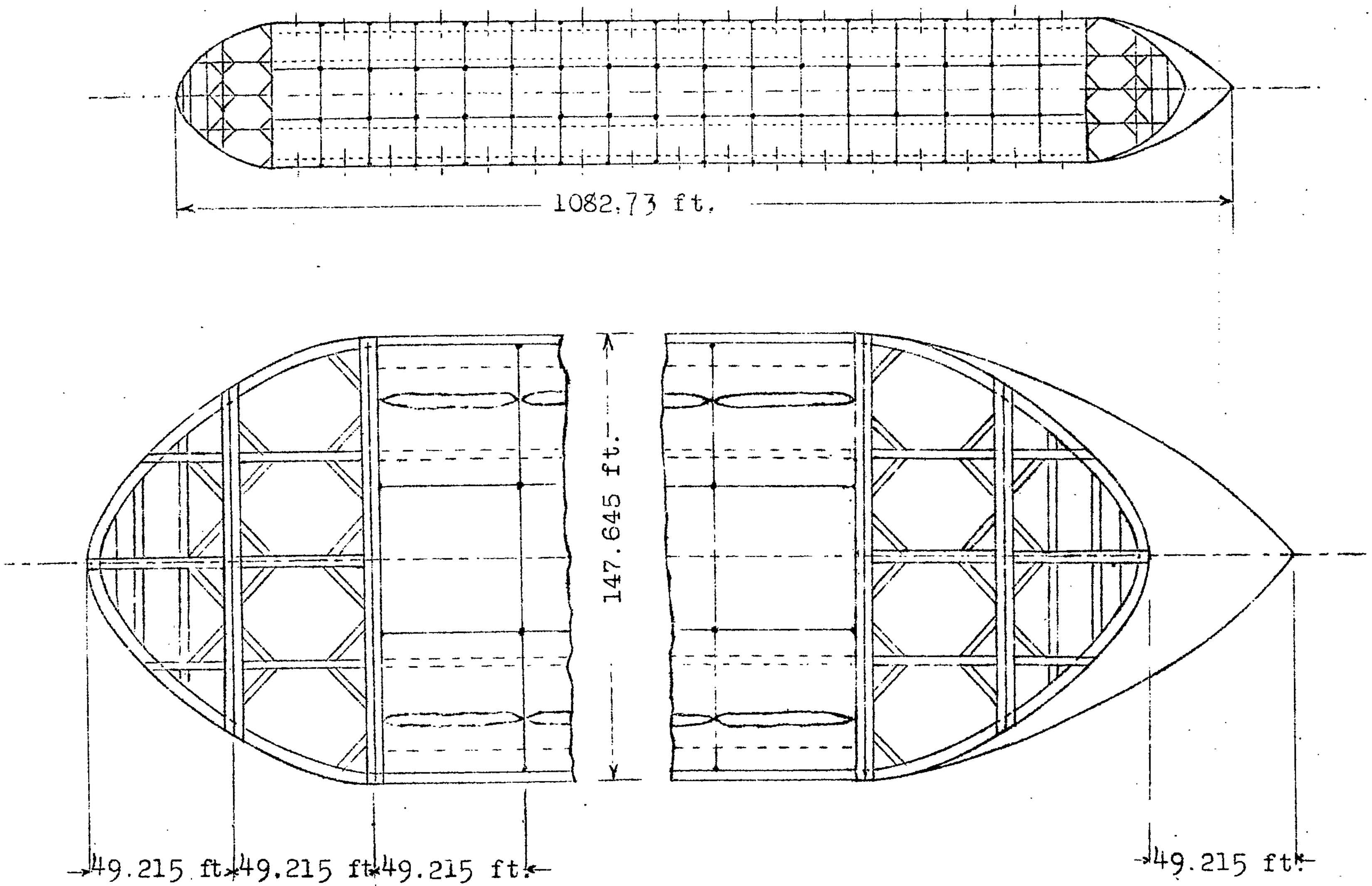


Fig. 4. Sectional plan.